**Instrument Preparation**

Clean all instruments and materials prior to sterilization. Dirt, blood and gross contaminants should be completely removed as they compromise sterilization. Always soak instruments in water with detergent immediately after surgery to remove blood and debris, and to facilitate cleaning. Instruments can be washed manually with a brush or in a washer sterilizer. In certain cases it may be necessary to use an ultrasonic cleaner “for difficult to clean” instruments.

Rinse instruments thoroughly after washing to remove any residues from the cleaning agents. Dry and safely store the instruments after cleaning.

Dry instruments and supplies should be loosely packed in standard or special packs in order of use. Take special care to avoid damaging delicate instruments. Packs should be dated. Sterilization indicators e.g. autoclave tapes or test cultures should always be included. Note that autoclave tapes only indicate that the surface reached the required temperature.

Packs should be stored in an appropriate manner after sterilization. Wrapped and sterilized packs are good for 6 months if properly stored. Storing packs in sealed in plastic bags prolongs their shelf life.

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**Physical sterilization**

It is critical that you start your surgery with sterile instruments. Instruments may be sterilized by physical or chemical means. Steam sterilization in an autoclave (121°C for 15 min or 131°C for 3 min) is extremely effective. Autoclaves should not be used for temperature sensitive instruments. Some corrosion may occur and sharp instruments may be dulled. Packs should not be removed from the autoclave until they are completely dry. Sterilization failure may occur if residual air is not evacuated during the operation of the autoclave. Dry heat in a chamber is a good alternative to a steam autoclave. It is non-corrosive and penetrates most materials and closed containers. Dry heat does not dull instruments, but the high temperatures attained may damage some materials. Instruments must be cooled before contacting tissues. Other physical means of sterilization include gamma irradiation primarily for heat or moisture sensitive items such as syringes, suture materials, scalpel blades and medical devices.

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| **Sterilization failure**   * Too tight packs * Improperly loaded autoclave * Defective autoclave * Insufficient temperature and pressure * Too short exposure time |

* Sterilization is the complete reduction of microbial life, which may be accomplished by physical (e.g. heat, radiation) or chemicals means.
* Sterilants are essentially the same as sporocides. They kill all microorganisms including bacterial endospores. A sporocidal product kills all microorganisms including bacterial endospores.
* Disinfectants, on the other hand, kill 100% of vegetative (actively growing) bacteria (of certain species) under conditions specified by the Environmental Protective Agency, but are not efficacious against fungi, viruses, Mycobacterium tuberculosis or bacterial spores. These agents are only effective if used according the manufacturers instruction and may be inactivated by organic matter such as blood, body fluids or tissues.

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**Chemical sterilization**

A variety of chemicals can be used to sterilize heat sensitive materials. All chemicals must be rinsed from the instruments using sterile saline or sterile water to avoid tissue damage. Often long contact times are required for sterilization. Organic materials may decrease effectiveness of these chemicals. All surfaces must be exposed and tubing must be filled with the solution. Effectiveness is dependent on adequate contact time with the instruments, proper mixing, age of the solution, and absence of organic material from the instruments. Most chemical sterilants have to be “activated” in order to be effective. Follow manufacturers instructions and avoid mixing incompatible compounds, and remember that most of these chemicals are hazardous agents. Disinfectants should not be used as sterilants. Residual chemicals must be rinsed off before using the instruments.

Examples of common chemical sterilants include:

* 2% Glutaraldehyde for 10 hours (Cidex®, Abcocide®). Shelf life 14-28 days after activation depending on type.
* 8% Formaldehyde plus 70% alcohol 18 hours.
* 7% stabilized hydrogen peroxides 8 hours (Accelerated Hydrogen Peroxide®, Virox STF®, Sporox®). Shelf life 21 days.
* 7.35% hydrogen peroxide and 0.23% peracetic acid 3 hours (EndoSpor® plus). Shelf life 14 days.
* Chlorine dioxide 1:5 solution 6 hours. Must be mixed daily (Clidox®).
* 1.37% Sodium hypochlorite 6 hours. Shelf life 14 days after activation (Alcide®).
* Always follow manufacturers’ recommendations.

Ethylene oxide gas sterilizes instruments in 3-7 hours when applied at 21-60°C at 40-60% relative humidity using specialized equipment. Ethylene oxide is flammable, explosive, toxic, and very irritating to tissues. All instruments must be aerated for 8-12 hours at 50-60°C or 1-7 days at room temperature.

**Validation of Sterilization**

* Physical methods – thermocouples placed with load
* Chemical methods – packed within load or autoclave tape
* Biological methods – bacterial spores, used once a week
* Bacillus stearothermophilus for steam autoclaves
* Bacillus subtilis for ethylene oxide
* Micrococcus radiodurans for gamma radiation

surgical tissue forceps, Graefe fixation forceps

curved Mosquito or Crile hemostatic tissue forceps

preferably curved Mayo scissors

Metzenbaum scissors